ZooKeys 1183: 219–231 (2023)
DOI: 10.3897/zookeys.1183.113182

Research Article

The Oriental fungus-feeding genus *Azaleothrips* Ananthakrishnan, 1964 from China with one new species and four new records (Thysanoptera, Phlaeothripidae, Phlaeothripinae)

Lihong Dang[1], Yaya Li[1], Laurence A. Mound[2], Gexia Qiao[3,4]

1 *School of Bioscience and Engineering, Shaanxi University of Technology, Hanzhong, 723000, China*
2 *Australian National Insect Collection, CSIRO, PO Box 1700, Canberra, ACT 2601*
3 *Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, No. 1 Beichen West Road, Chaoyang District, Beijing 100101, China*
4 *College of Life Science, University of Chinese Academy of Sciences, No. 19, Yuquan Road, Shijingshan District, Beijing 100049, China*

Corresponding author: Gexia Qiao (qiaogx@ioz.ac.cn)

Abstract

Azaleothrips, a genus of fungus-feeding Phaeothripinae, is easily recognized by the complex sculpture on the body surface. It is species-rich in the Oriental region, with 10 species here recognized from China, including *A. sphaericus* **sp. nov.** and four new records. An illustrated key to the species from China is provided.

Key words: Identification key, mycophagous, *Phlaeothrips*-lineage, taxonomy

OPEN ACCESS

Academic editor: Elison F. B. Lima
Received: 23 September 2023
Accepted: 25 October 2023
Published: 9 November 2023

ZooBank: https://zoobank.org/B3951895-F3CE-4827-A970-7BAAB51ABA0F

Citation: Dang L, Li Y, Mound LA, Qiao G (2023) The Oriental fungus-feeding genus *Azaleothrips* Ananthakrishnan, 1964 from China with one new species and four new records (Thysanoptera, Phlaeothripidae, Phlaeothripinae). ZooKeys 1183: 219–231. https://doi.org/10.3897/zookeys.1183.113182

Copyright: © Lihong Dang et al.
This is an open access article distributed under terms of the Creative Commons Attribution License (Attribution 4.0 International – CC BY 4.0).

Introduction

The fungus-feeding species in Phlaeothripinae belong to the *Phlaeothrips*-lineage and are usually found in dry, dead leaves, twigs, branches, and grasses (Mound and Marullo 1996). Of the 32 genera in this group recorded from China (Dang et al. 2014), *Azaleothrips* is easily recognized by the following combination of characters: body surface strongly reticulate, with many wrinkles or tubercles in lines (Figs 1–7); major setae short and broadly expanded at apex (Figs 15–19); postocular setae close together and placed near inner margin of eyes; maxillary stylets retracted to eyes and medially close together. This genus was treated as a member of the *Idiothrips* group, with three genera, *Idiothrips*, *Stegothrips*, and *Strepterothrips* (Okajima 1976), of which the first two are unknown in China but easily distinguished from *Azaleothrips*, as indicated by Okajima and Masumoto (2014). *Strepterothrips*, of which only *S. orientalis* of the 15 known species is recorded from Taiwan, is closely related to the genus *Azaleothrips* (Okajima 1995; ThripsWiki 2023), but it can be distinguished by having one sense cone on antennal segment III and a well-developed fore tarsal ventral hamus (Okajima and Masumoto 2014). In addition, *Strepterothrips* species have seven antennal segments, with the morphological VIII joined to VII without a suture, are usually wingless, and have antennal segment II obviously

larger than segment I. In comparison, *Azaleothrips* has antennal segment VIII distinct from VII and with at least a complete suture (Figs 8–14), is usually macropterous, and antennal segment II is regular. A related genus, *Stictothrips*, also shares the complex body sculpture and fan-shaped major setae with *Azaleothrips*, but it has the fore wings curiously constricted and twisted (Mound and Tree 2015).

In the process of identifying slides of *Azaleothrips* from China, two species were recognized, *A. laevigatus* and *A. dentatus*, which seem to be unusual in having the dorsal view of body not heavily reticulate (Fig. 2), the maxillary stylets and mouth cone elongate (Fig. 3), and the major setae relatively longer. These two are similar to females of the genus *Ablemothrips*, with which they share the following characters: postocular setae close, antennal segments VII–VIII fused, antennal segments III–IV with three and four sense cones respectively, and forewings slender and weakly medially constricted. The only character state that distinguishes *Ablemothrips* from the above two species is the sexual dimorphism in the position of the postocular setae, which are widely separated in males of all three *Ablemothrips* species(Okajima 1999). This condition is not recorded in any *Azaleothrips*.

Among the 35 species of *Azaleothrips*, two species groups have been recognized: the *amabilis* species group with nine species, and the *moundi* species group with 26 species (Okajima and Masumoto 2014). In China, only two species have been recorded (Han 1992; Dang et al. 2014), *A. moundi* and *A. siamensis*, but three more were described from Taiwan by Okajima and Masumoto (2014): *A. formosae*, *A. taiwanus*, and *A. atayal*.

The objective here is to recognize species of the Oriental genus *Azaleothrips* in the first author's thrips collection, to describe a new species, and to provide an illustrated key to 10 Chinese *Azaleothrips* species, including four new records for *A. laevigatus*, *A. laocai*, *A. lepidus* and *A. templeri*. The new species, *A. sphaericus* sp. nov., obviously belongs to the *moundi* species group because it has two sense cones on antennal segment III (Fig. 13), closely fused VII–VIII (Fig. 13), no fore-tarsal tooth in either sex, an expanded S2 on male tergite IX (Fig. 28), and many short discal setae on the pronotum and metanotum (Figs 19–21).

Materials and methods

The descriptions and photomicrographs were produced from slide-mounted specimens under a Nikon Eclipse 80i microscope with a Leica DM2500 camera and using differential interference contrast illumination. These images were processed with Automontage and Photoshop v. 7.0. The abbreviations used for the pronotal setae are as follows: am – anteromarginal, aa – anteroangular, ml – midlateral, epim – epimeral, pa – posteroangular. The unit of measurement in this study is the micrometre. Most specimens studied here are available in the School of Bioscience and Engineering, Shaanxi University of Technology (**SNUT**), Hanzhong, China, the Australian National Insect Collection (**ANIC**), Canberra, Australia, and the National Zoological Museum of China (**NZMC**), Institute of Zoology, Chinese Academy of Sciences, Beijing, China. Additionally, two slides of types were loaned from Taiwan Agricultural Research Institute (**TARI**), Taiwan, China.

Taxonomy

Azaleothrips Ananthakrishnan, 1964

Azaleothrips Ananthakrishnan, 1964: 220. Type species *Azaleothrips amabilis* Ananthakrishnan 1964, by monotypy.

Note. The number of sense cones on antennal segments III–IV is a very diagnostic character in many thysanopteran taxa. Especially in *Azaleothrips*, two species groups were proposed because of two sense cones on III and two or three cones on IV in the *moundi* species group, and three and four on antennal segments III–IV, respectively, in the *amabilis* species group. These numbers vary between species, but are stable within each species. Furthermore, the macropterous forms in this genus are very common, but three species also have micropterae which usually bear three well-developed sub-basal setae, *A. moundi*, *A. simulans* and *A. sphaericus* sp. nov., that all belong to *moundi* species group. The complex sculptures on the body surface are also various ranged from weakly reticulate to strongly reticulate with wrinkles or tubercles inside or along lines. Therefore, these variations are not helpful to give a clear generic diagnosis, but fortunately an excellent one is available in a recent paper (Okajima and Masumoto 2014).

Key to species of *Azaleothrips* from China

A. taiwanus and *A. atayal* are included in the key based on the excellent original descriptions.

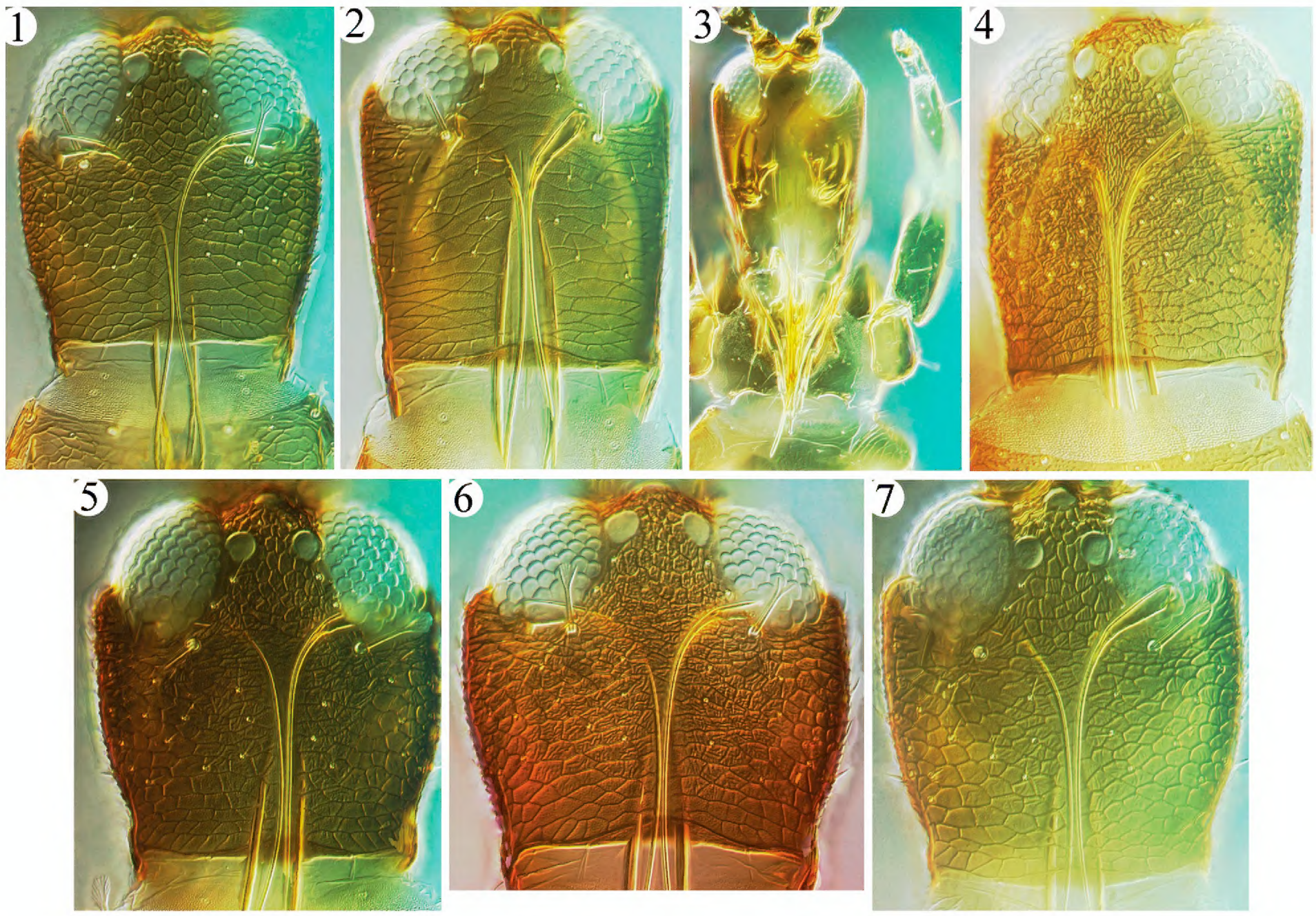
1 Antennal segment III with two sense cones **2**
– Antennal segment III with three sense cones **3**
2 Antennal segment IV with two sense cones (Fig. 11) ..... ***A. moundi***
– Antennal segment IV with three sense cones (Fig. 13) ..... ***A. sphaericus* sp. nov.**
3 Fore-femora yellow to pale brown, much paler than head **4**
– Fore-femora brown to dark brown, as dark as head **6**
4 Metanotum longitudinally reticulate on anterior half, and with polygonal reticulations on posterior half (Fig. 23) ..... ***A. templeri***
– Metanotum longitudinally reticulate or striate, and without polygonal reticulations **5**
5 S1 setae on abdominal tergite IX slightly shorter than half the length of tube in both sexes ..... ***A. lepidus***
– S1 setae on abdominal tergite IX longer than half the length of tube in both sexes ..... ***A. formosae***
6 Pronotum yellowish brown, at least paler than head ..... ***A. siamensis***
– Pronotum uniformly brown, as dark as head **7**
7 Head sculptured with very weak lines of reticulation (Fig. 2); mouth-cone long and sharply pointed that reaches to mesopresternum (Fig. 3); S2 on tergite IX sharply pointed at apex in both sexes (Fig. 29) ..... ***A. laevigatus***
– Head strongly sculptured with reticulation; mouth-cone moderately long that reaches to posterior margin of ferna at most; S2 on tergite IX expanded at apex in female **8**

8 Pronotum sculptured with lines of reticulation as well as many small tubercles along lines ..... ***A. taiwanus***
– Pronotum finely reticulated, but almost smooth along reticles, without tubercles..... **9**
9 Tergite IX setae S1 much shorter than half of tube length; antennal segment III clearly yellow (Fig. 9)..... ***A. laocai***
– Tergite IX setae S1 almost as long as half of tube length; antennal segment III somewhat shaded at apical half..... ***A. atayal***

Azaleothrips atayal Okajima & Masumoto, 2014

Azaleothrips atayal Okajima & Masumoto, 2014: 309.

Comments. Described from Taiwan on dead leaves and branches, this species is a member of the *amabilis* species group, as indicated by Okajima and Masumoto (2014). *Azaleothrips atayal* is closely related to another Taiwan species, *A. formosae*, which can be distinguished from *A. formosae* by its darker body; it has also been collected at lower altitudes, as mentioned by Okajima and Masumoto (2014). Unfortunately, no specimen was studied here, but the species is readily placed in the above key using the excellent illustrated description.



Figures 1–7. Heads of *Azaleothrips* species **1** *A. formosae* **2** *A. laevigatus* **3** *A. laevigatus*, ventral view of head **4** *A. sphaericus* sp. nov. **5** *A. lepidus* **6** *A. siamensis* **7** *A. templeri*.

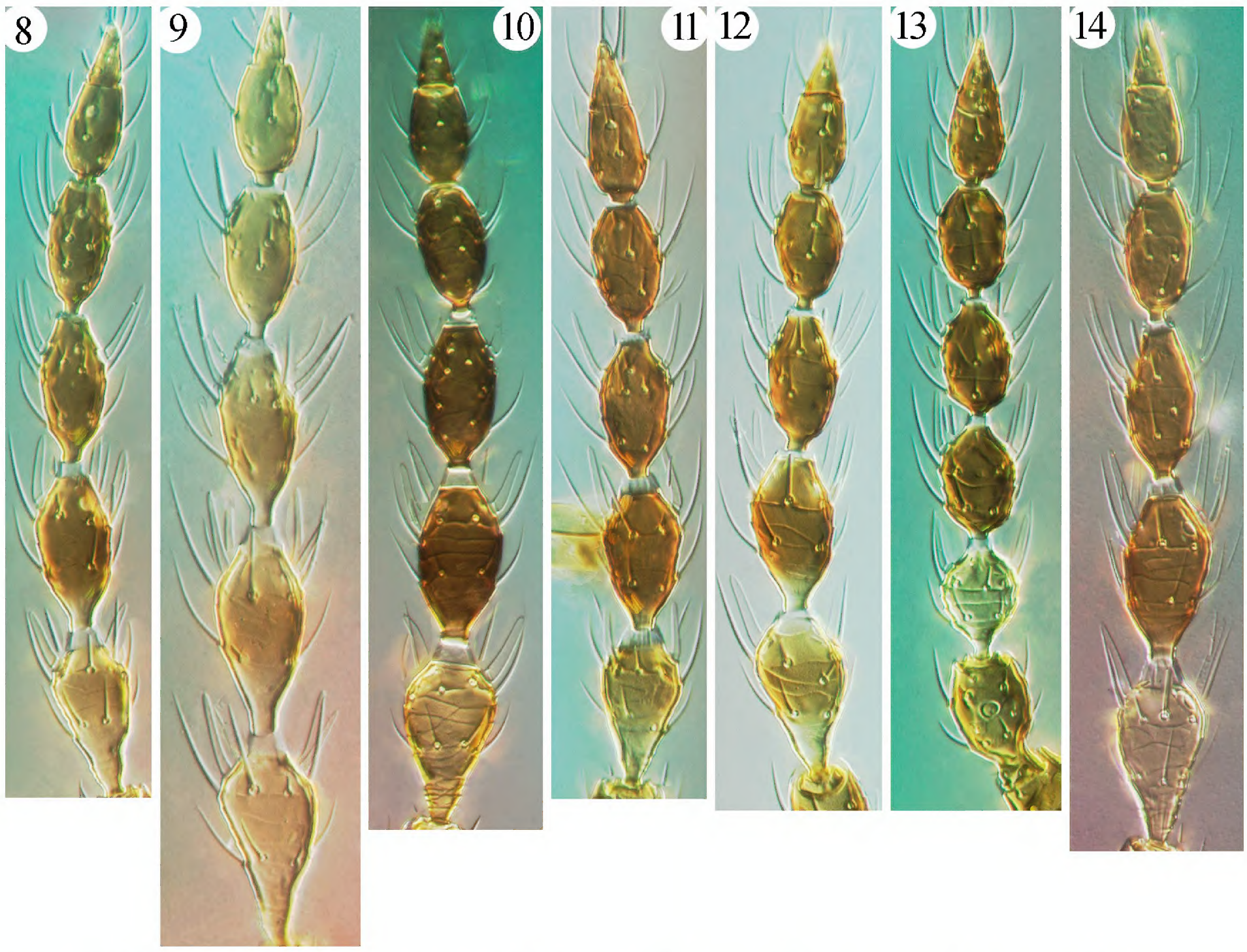
Azaleothrips formosae Okajima & Masumoto, 2014

Figs 1, 8, 15, 27

Azaleothrips formosae Okajima & Masumoto, 2014: 320.

Specimens studied. China – **Yunnan** • 1♀ (SNUT); Puer, Zhenyuan; on dead leaves; 8.vii.2022; Yanqiao Li leg. • 1♂ (SNUT); Lincang, Cangyuan; on dead leaves; 8.vi.2021; Xia Wang & Chengwen Li leg. • 1♂ (ANIC); Kunming; on bamboo grass; 24.ix.2019; Laurence Mound leg.

Comments. This species was described on many specimens, including types and non-types, from Taiwan that were collected on dead branches. A female and two males from Yunnan are identified as *A. formosae* because they show no difference in their morphology. However, they differ in their coloration; the female has the prothorax largely yellow, like non-paratypic specimens from Kenting National Park (Taiwan), and one male has a brownish prothorax (Fig. 15), slightly paler than the head, and all femora yellowish brown with the apical quarter pale; the other male has a pale prothorax, like the paratypes. Moreover, the pore plate on abdominal sternite VIII is a little broader in the Yunnan specimens (Fig. 27), but S2 setae on tergite IX are pointed at the apex, as in the types.



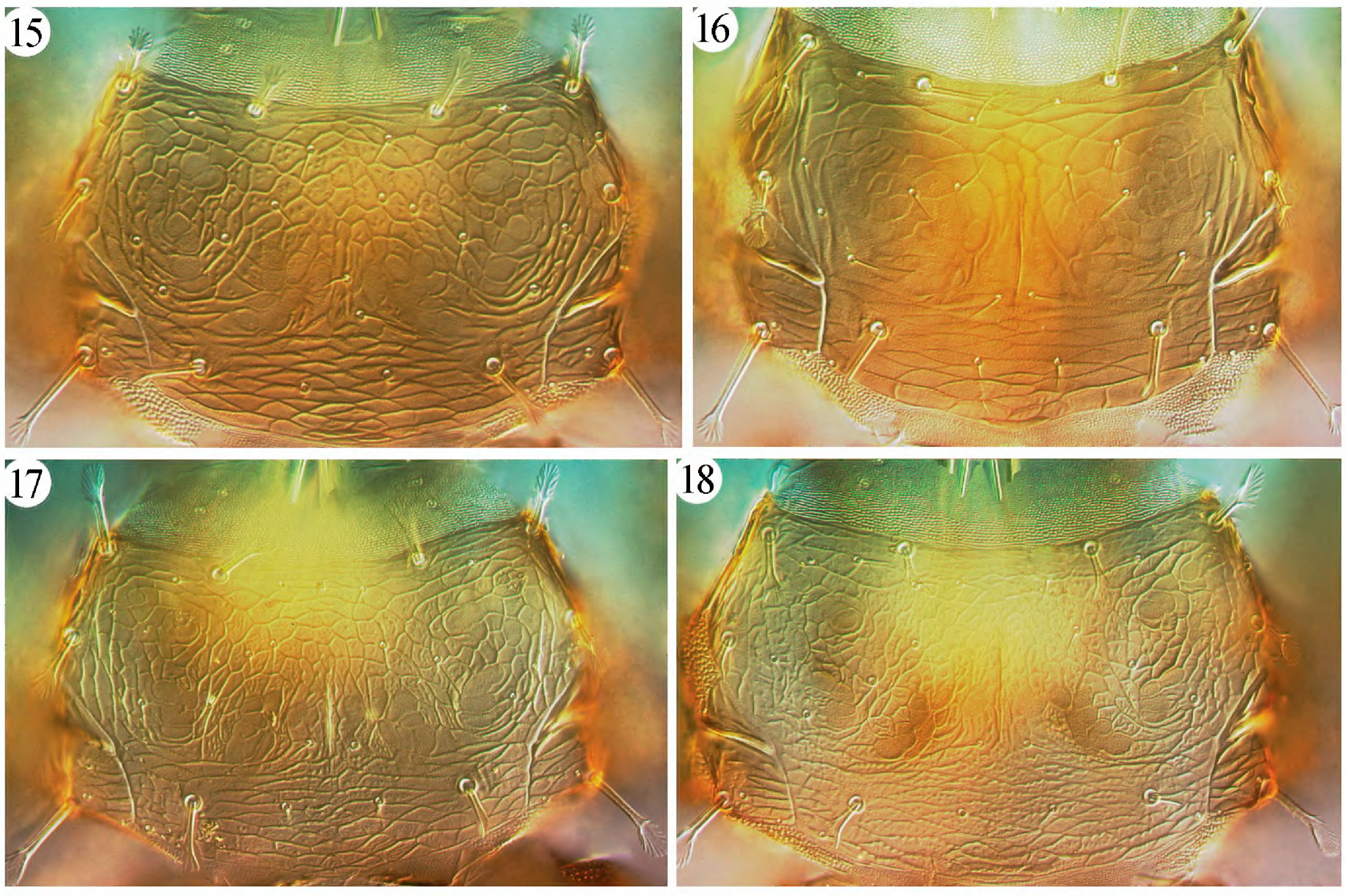
Figures 8–14. Antennae of *Azaleothrips* species **8** *A. formosae* **9** *A. laocai* **10** *A. laevigatus* **11** *A. moundi* **12** *A. siamensis* **13** *A. sphaericus* sp. nov. **14** *A. templeri*.

***Azaleothrips laevigatus* Okajima, 2006**
Figs 2, 3, 10, 16, 25, 29

Azaleothrips laevigatus Okajima, 2006: 192.

Specimen studied. China – **Guangxi** • 1♀1♂ (SNUT); Chongzuo; on dead wood; 9 & 25.vii.2021; Xia Wang leg.

Comments. Described from Japan on dead *Casuarina* branches, this species is distinguished easily from other *Azaleothrips*, except for two Philippine species, *A. philippinensis* and *A. bifidius*, in having S2 on abdominal tergite IX of males pointed at its apex (Fig. 29). *Azaleothrips laevigatus* can be distinguished from these Philippine species by the weaker sculpture on the head and pronotum and transverse pore plate on male sternite VIII (Figs 2, 16, 29). This species is closely related to an Indonesian species, *A. dentatus*, in having weak sculpture on the body surface and shorter major setae, and in the head shape, but in *A. dentatus* the fore-tibia has an apical inner tubercle. Additionally, the head of *A. laevigatus* has weak sculpture, almost straight cheeks, postocular setae close together and slender, and long stylets that reach the eyes (Fig. 2), similar to species of *Ablemothrips*. However, *A. laevigatus* has a long mouth-cone which is sharply pointed and reaching the mesopresternum (Fig. 3), and the postocular setae are also close together in male, while *Ablemothrips* species have the mouth cone short and rounded, and the postocular setae of males are sexually dimorphic and widely separated (Okajima 1999). A female and male from Guangxi, China are recognized as *A. laevigatus* because there is no differences in morphology and coloration, as compared to the original description (Okajima 2006).



Figures 15–18. Pronotum of *Azaleothrips* species **15** *A. formosae* **16** *A. laevigatus* **17** *A. lepidus* **18** *A. siamensis*.

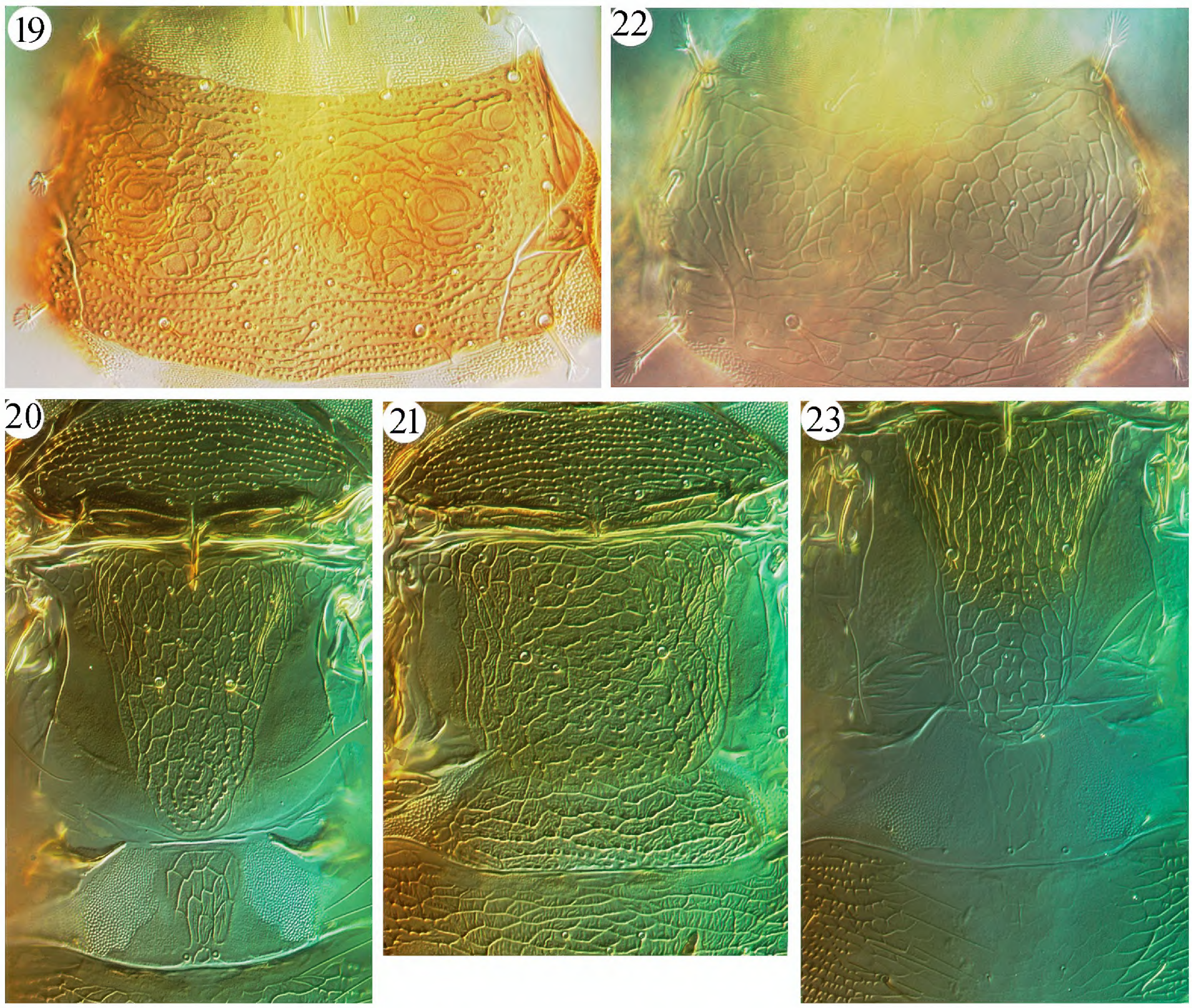
Azaleothrips laocai Okajima & Masumoto, 2014

Fig. 9

Azaleothrips laocai Okajima & Masumoto, 2014: 325.

Specimens studied. China – **Shaanxi** •1♀ (SNUT); Hanzhong; on dead leaves; 20.vii.2017; Lihong Dang leg. • 1♀ (SNUT); Yanan; 25.vii.2019; Weiyan Liu leg.

Comments. *Azaleothrips laocai* was described from Vietnam on dead branches. It belongs to the *amabilis* species group, which bears three and four sense cones on antennal segments III and IV, respectively. Currently, this species has the largest body size of any known *Azaleothrips* species, with two females from Shaanxi, China about 2270–2350 μm in body length, whereas the body lengths of other *Azaleothrips* spcies are usually no more than 2000 μm. These two females from Shaanxi show a little difference in antennae coloration; segment IV is brown, with the apex and base pale, as well as the base of V pale (Fig. 9), but in the original description of *A. laocai* the basal neck of IV is yellowish and V is uniformly brown.



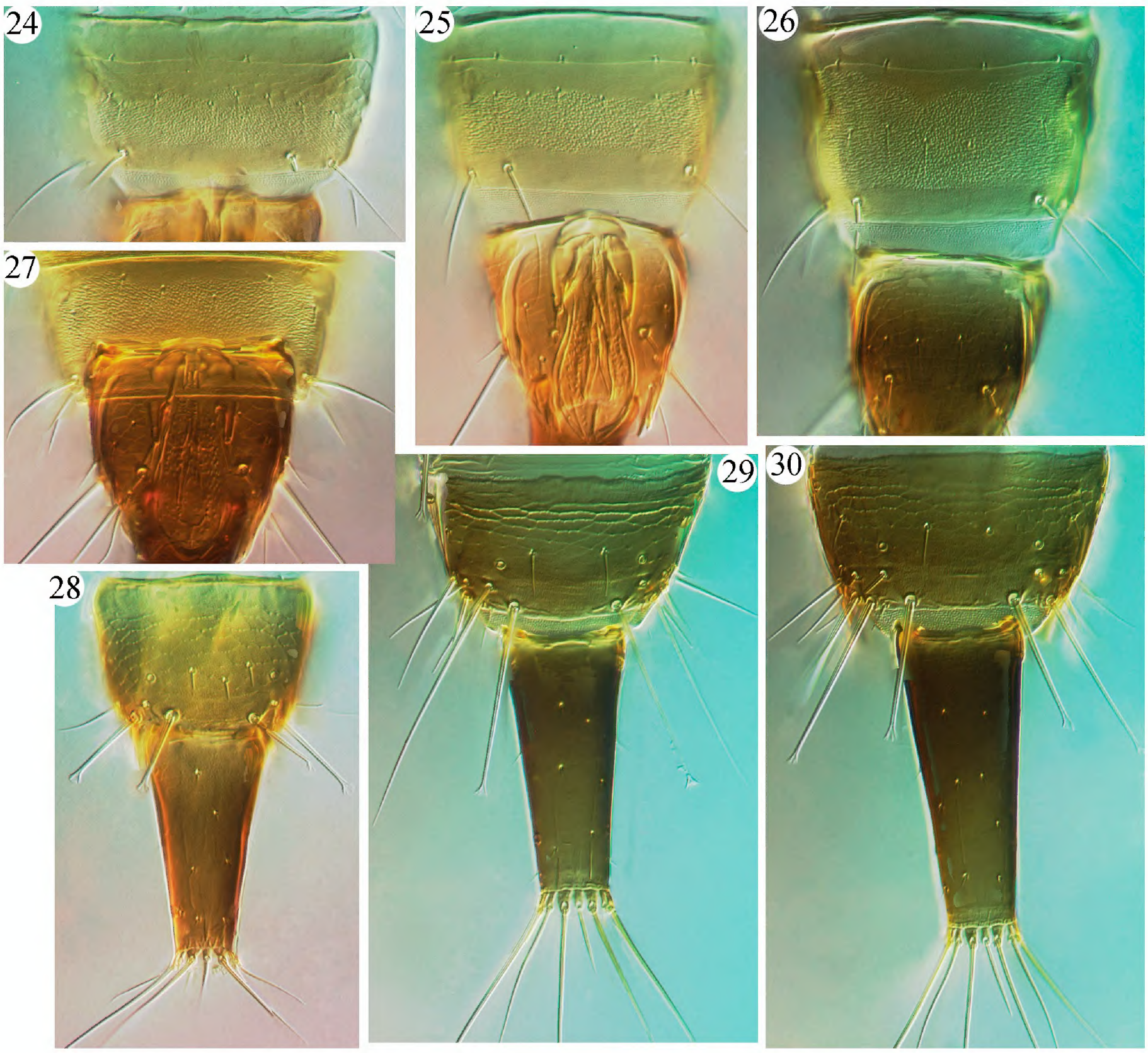
Figures 19–23. *Azaleothrips* species **19–21** *A. sphaericus* sp. nov. **19** pronotum **20** mesonotum, metanotum, and pelta of macropteran female **21** mesonotum, metanotum, and pelta of micropterous female **22–23** *A. templeri* **22** pronotum **23** metanotum and pelta, macropterous female.

***Azaleothrips lepidus* Okajima, 1978**
Figs 5, 17, 26

Azaleothrips lepidus Okajima, 1978: 386.

Specimens studied. China – **Yunnan** • 1♀1♂ (SNUT); Lincang; on dead branches; 4 & 7.vi.2021; Xia Wang & Chengwen Li leg. LAOS – **Champasak** • 4♀1♂ (ANIC); on dead wood; 12.vi.2018; Alice Wells leg.

Comments. Described from Thailand on dead leaves, this species is here newly recorded from China. *Azaleothrips lepidus* is very similar to *A. toshifumii*, with which it is sympatric, but they can be distinguished by the coloration of antennae and legs (Okajima and Masumoto 2014). Two specimens from China have antennal segment IV uniformly brown, fore-coxae and femora largely yellow, with outer side shaded, and the mid- and hind-tibiae slightly medially shaded. Especially, their antennal segment III is clear yellow, as are the specimens from Laos, which were originally described as yellow to yellowish brown (Okajima 1978).



Figures 24–30. Abdomen of *Azaleothrips* species **24–27** pore plate on sternite VIII **24** *A. sphaericus* sp. nov. **25** *A. laevigatus* **26** *A. lepidus* **27** *A. formosae* **28–30** tergites IX–X **28** *A. sphaericus* sp. nov. **29** *A. laevigatus* **30** *A. siamensis*.

Azaleothrips moundi Okajima, 1976

Fig. 11

Azaleothrips moundi Okajima, 1976: 19.

Specimens studied. China – **Taiwan** • 2♀ (TARI, female holotype and paratype of '*magnus*'); Taipei, Hsien; on dead twigs of *Morus australis*; 12.viii.1978; Liansheng Chen leg. **Sichuan** • 1♀ (SNUT); Chengdu; on dead leaves; 14.viii.2021; Xin Li leg. **Shanxi** • 1♂ (SNUT); Jincheng, Mishui; 16.vi.2022; Yuxin Gao leg.

Comments. This species, one of the two species from China that belong to the *moundi* species group, was described from Japan and Taiwan on dead twigs. It is unique in *Azaleothrips* because antennal segments III–IV both have two major sense cones (Fig. 11). The holotype female and paratype male of *A. magnus* Chen, 1980, which was synonymized with *A. moundi* by Okajima and Masumoto (2014), were here studied, but both specimens had crack inside the balsam that seems to have allowed entry of air under the cover slip. These specimens have the third antennal segment III clear yellow, as in the original description of *A. moundi*. Two micropterous female and male from Sichuan and Shanxi recognized here as *A. moundi* have antennal segment III shaded on apical half. This was also noted for *A. Lepidus*, as mentioned above.

Azaleothrips siamensis Okajima, 1978

Figs 6, 12, 18, 30

Azaleothrips siamensis Okajima, 1978: 389.

Specimens studied. China – **Guangxi** • 1♀ (SNUT); Chongzuo, Daxin; on dead wood; 25.vii.2021; Xia Wang leg. **Yunnan** • 4♀1♂ (NZMC); Mengla; one dead branch; 10 & 17.iv.1997; Yunfa Han leg. **Chongqing** • 1♀ (NZMC); one dead branch; 1.viii.1999; Yunfa Han leg.

Comments. Described from northern Thailand on dead leaves, this species was first recorded from China, Guizhou, by Han (1992). Here, six females and one male each from Guangxi, Chongqing, and Yunnan suggest that this species may be common in southern China. These specimens have much paler pronotum (Fig. 18) and shorter anal setae than the specimens described from Thailand in the original description (Okajima 1978), but no other differences have been observed.

Azaleothrips sphaericus sp. nov.

https://zoobank.org/43025455-5059-4D41-82A1-7E538200640D

Figs 4, 13, 19–21, 24, 28

Specimens studied. ***Holotype*,** China – **Guangxi** • ♀ macroptera (SNUT); Chongzuo, Fusui; on dead branch; 8.viii.2021; Xia Wang leg. ***Paratypes*,** China – **Guangxi** • 1♀ macroptera (SNUT); Nanning, Wuming; 18.vii.2021; Xia Wang leg. • 3♀ microptera (SNUT, ANIC); Chongzuo, Daxin; 25.vii.2021; Xia Wang leg. • 1♂ microptera (SNUT); Nanning, Shanglin; 18.vii.2021; Xia Wang leg.

Description. *Holotype*. Female macroptera. Body uniform brown. Antennal segment III clear yellow (Fig. 13); other segments brown, but I–II slightly lighter than head. All femora brown, with apices and extreme bases yellowish; all tibiae brown at middle, with apices and bases yellowish; mid- and hind-tibiae sightly paler. Fore-wing shaded with brown, paler in basal quarter.

Head (Fig. 4). Head distinctly longer than wide; dorsal surface strongly sculptured with reticles, with scattered small wrinkles among reticles, especially between postocular setae. Compound eyes comparatively small, about 0.3 times as long as head. Postocular setae shorter than half length of eyes. Antennal segments VII and VIII tightly fused (Fig. 13); median segments spherical, III smaller than IV; segment III with two (1 + 1), segment IV with three (1 + 2) sense cones.

Thorax (Figs 19, 20). Pronotum distinctly sculptured with rows of small tubercles, but median portion with distinctive circular sculpture; pronotum with 26 short setae (Fig. 19). Basantra present, but weak. Mesonotum with small, dentate microtrichia or tubercles along transverse lines of sculpture, almost smooth between lines (Fig. 20). Metanotum with polygonal reticulations, with delicate wrinkles within reticles, and with small tubercles along lines of reticles on posterior quarter (Fig. 20); anterior half with 15 short setae, including three pairs in anterior angles. Mesopresternum boat-shaped but narrowed laterally. Metathoracic sternopleural suture present. Fore-tarsus unarmed. Fore-wing contracted medially with 4/7 duplicated cilia; subbasal setae S3 longer than S1 and S2, but much shorter than the contracted portion of fore-wing.

Abdomen (Figs 24, 28). Pelta distinctly medially reticulate, with delicate wrinkles within reticles (Fig. 20). Abdominal tergites II–VII weakly sculptured with transverse reticles or lines, dentate microtrichia in lateral third, with two pairs of wing-retaining setae; posterior pair much larger than anterior pair. Tergite VIII with a pair of small setae medially; tergite IX with four short setae at middle (Fig. 28); S1 setae on tergite IX a little shorter than half length of tube, expanded at apex (Fig. 28); S2 slightly longer than S1, expanded at apex (Fig. 28); S3 as long as tube, pointed at apex. Tube short, about 0.6 times as long as head. Anal setae longer than tube.

Measurements (holotype female in μm). Body length 1580. Head length 170, width across cheeks 165. Compound eye dorsal length 55. Pronotum length 110, width 200. Fore wing length 550. Tube length 105, width across base 55, apical width 30. Antenna length 270, segments I–VIII length (width) as follows: 30 (30), 40 (30), 35 (28), 40 (28), 37 (25), 37 (25), 30 (20), 20 (15). Postocular setae about 23. S1–S3 on tergite IX 43, 53, 115. Anal setae 115.

Female microptera. Color and structure similar to macropterous female, but tubercles on lines of reticles in most part of head, metanotum, pelta, and posterior median portion of tergites II–VII; metanotum and pelta broad (Fig. 21); eyes and two pairs of wing-retaining setae relatively small.

Measurements (paratype micropterous female in μm). Body length 1470. Head length 180, width across cheeks 170. Compound eye dorsal length 45. Pronotum length 125, width 210. Fore wing length 125. Tube length 100, width across base 55, apical width 30. Antenna length 305, segments I–VIII length (width) as follows: 30 (30), 42 (30), 35 (27), 40 (27), 40 (27), 40 (27), 27 (20), 25 (17). Postocular setae about 25. S1–S3 on tergite IX 37, 67, 110. Anal setae 125.

Male microptera. Color and structure very similar to micropterous female, but mid- and hind-tibiae yellow with slightly shaded medially. Pore plate on abdominal sternite VIII distinct, narrow (Fig. 24). S2 on abdominal tergite IX expanded at apex, slightly longer than S1.

Measurements (paratype micropterous male in μm). Body length 1350. Head length 170, width across cheeks 155. Compound eye dorsal length 45. Pronotum length 120, width 185. Fore wing length 100. Tube length 95, width across base 50, apical width 25. Antenna length 260, segments I–VIII length (width) as follows: 27 (27), 35 (27), 30 (27), 35 (25), 35 (25), 35 (25), 27 (20), 22 (15). Postocular setae 20. S1–S3 on tergite IX 35, 40, 95. Anal setae 105.

Etymology. Latin, *sphaericus*, referring to the spherical antennal segment III.

Comments. This new species is unusual among *Azaleothrips* species in having antennal segment III almost spherical and smaller than IV, a condition somewhat similar with some *Strepterothrips* species. The new species is similar to *A. phuketanus* and *A. simulans* in having two and three sense cones on antennal segments III and IV, respectively, but it differs from *A. phuketanus* in having antennal segment III shorter than IV (Fig. 13), the anterior part of metanotum with 15 small setae before the major pair of setae, whole of pronotum covered with tubercles (Figs 19, 20), and S1 setae of tergite IX shorter than one-half the length of the tube (Fig. 28); in *A. phuketanus* antennal segment III is much longer than IV, the anterior part of metanotum bears seven small setae before the major pair of setae, the pronotum only has tubercles posterior to median, and S1 setae of tergite IX is longer than half the length of tube. It is distinguished from *A. simulans* in having antennal segments I–II concolorous with the head, VI uniformly brown, antennal segment III shorter than IV (Fig. 13), the dorsal surface of head reticulate and without an asperate area (Fig. 4), the metanotum with wrinkles among reticles and the anterior part of metanotum with 15 small setae before the major pair of setae (Fig. 20), and a hat-shaped pelta; in *A. simulans* antennal segments I and II are paler than the brown head, the basal neck of VI is yellow, antennal segment III much longer than IV, the dorsal surface of the head is reticulate but medially is aspirate and not reticulate, the metanotum is strongly asperate and without lines of reticulation at centrally, the anterior part of metanotum has at most 10 small setae before the major pair of setae, and the pelta is trapezoid. It is also similar to *A. moundi* in having antennae brown and only with III yellow and with two sense cones, in sculpture of the head and pronotum, and setae on tergite IX, but these species can be distinguished as follows. *Azaleothrips sphaericus* has antennal segment IV with three major sense cones, antennal segment III spherical, with a short stem (Fig. 13) which is almost as long as wide, antennal segment IV uniformly brown, postocular setae about half length of the eyes (Fig. 4), apices and bases of all tibiae pale, light brown, and pelta with tubercles on lines of transverse reticulation in microptera (Fig. 21); in *A. moundi* antennal segment IV has two major sense cones, antennal segment III is not spherical and longer than wide, basal neck of IV is paler, postocular setae shorter than one-half length of the eyes, all tibiae brown to dark brown, apices and bases of mid- and hind-tibia pale, and pelta polygonally reticulate in microptera.

Azaleothrips taiwanus **Okajima & Masumoto, 2014**

Azaleothrips taiwanus Okajima & Masumoto, 2014: 342.

Comments. Described from Taiwan on dead branches, this species was not satisfactorily distinguished from another Taiwan species, *A. atayal*, in the original description (Okajima and Masumoto 2014). The only difference between these two species is the presence or absence of many small tubercles in the reticulation of head and pronotum, as indicated in the above key.

Azaleothrips templeri **Okajima & Masumoto, 2014**

Figs 7, 14, 22, 23

Azaleothrips templeri Okajima & Masumoto, 2014: 342.

Specimens studied. China – **Guangxi** •1♀ (SNUT); Qianzhou, Shiwandashan; 5.viii.2015; Chunfeng Li leg. LAOS – **Champasak** • 1♂ (ANIC); on dead leaves of Cordyline; 12.vi.2018; Alice Wells leg.

Comments. Described from West Malaysia on dead leaves, this species is similar to *A. lepidus* in having pale pronotum (Fig. 22) and fore-femora, but *A. templeri* can be easily distinguished from other Chinese species of *Azaleothrips*. It is distinguished by the presence of polygonal reticulation on the posterior half of the dorsal surface of metathorax (Fig. 23). A female from Guangxi is identified as *A. templeri*, and this is the first record of the species from China. A male from Laos is also recognized here as this species.

Acknowledgements

We are grateful to Liyun Jiang (IZCAS) and Kuiyan Zhang (NZMC) for giving access to the collections of NZMC, to Fengchyi Lin of the Taiwan Agricultural Research Institute, Taichung for arranging the loan of two type specimens of '*Azaleothrips magnus*', and to Alice Wells, Xia Wang, Yanqiao Li, Chengwen Li, Yuxin Gao, Chunfeng Li, Weiyan Liu, and Xin Li for collecting the specimens. Our special thanks are due to the subject editor, Elison Fabricio B. Lima, and the three reviewers for their valuable comments.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Funding

This work was supported by the Natural Science Basic Research program of Shaanxi Province [2023-JC-QN-0178], the National Natural Sciences Foundation of China [no. 31702042], the Youth Innovation Team of Shaanxi University (2023-77), the Key Collaborative Research Pro-

gram of the Alliance of International Science Organizations (grant no. ANSO-CR-KP-2020-04), Survey of Wildlife Resources in Key Areas of Tibet (ZL202203601), and the Second Tibetan Plateau Scientific Expedition and Research (STEP) program [grant no. 2019QZKK0501].

Author contributions

Lihong Dang: writing the original draft. Yaya Li: making slides and preparing images plates, Laurence Mound: reviewing and editing the manuscript and taking images. Gexia Qiao: reviewing final manuscript and funding support. All authors have read and agreed to the published version of the manuscript.

Author ORCIDs

Lihong Dang https://orcid.org/0000-0002-7571-8426
Yaya Li https://orcid.org/0009-0009-3227-5969
Laurence A. Mound https://orcid.org/0000-0002-6019-4762
Gexia Qiao https://orcid.org/0000-0002-7300-6812

Data availability

All of the data that support the findings of this study are available in the main text.

References

Ananthakrishnan TN (1964) Thysanopterologica Indica II. Entomologisk Tidskrift 85: 218–235.

Dang LH, Mound LA, Qiao GX (2014) Conspectus of the Phlaeothripinae genera from China and Southeast Asia (Thysanoptera, Phlaeothripidae). Zootaxa 3807(1): 001–082. https://doi.org/10.11646/zootaxa.3807.1.1

Han YF (1992) Thysanoptera: Aeolothripidae, Thripidae, Phlaeothripidae. In: Huang Fu-Sheng (Ed.) Insects of Wuling Mountains Area, Southwestern China. Science Press, Beijing, 245–249.

Mound LA, Marullo R (1996) The thrips of Central and South America: An introduction. Memoirs on Entomology. International 6: 1–488.

Mound LA, Tree DJ (2015) Fungus-feeding Thysanoptera: Phlaeothripinae of the *Idiothrips* genus-group in Australia, with nine new species. Zootaxa 4034(2): 325–341. https://doi.org/10.11646/zootaxa.4034.2.5

Okajima S (1976) Descriptions of four new species of the *Idiothrips* complex (Thysanoptera, Phlaeothripidae). Kontyu 44: 13–25.

Okajima S (1978) Notes on the Thysanoptera from Southeast Asia III. Two new species of the genus *Azaleothrips* Ananthakrishnan (Phlaeothripidae). Kontyu 46: 385–391.

Okajima S (1995) The genus *Strepterothrips* Hood (Thysanoptera, Phlaeothripidae) from east Asia. Special Bulletin of the Japanese Society of Coleopterology 4: 213–219.

Okajima S (1999) The Oriental genus *Ablemothrips* (Thysanoptera: Phlaeothripidae), and sexual dimorphism in the postocular setae. Entomological Science 2: 257–263.

Okajima S (2006) The Insects of Japan. Vol. 2: the Suborder Tubulifera (Thysanoptera). Touka Shobo Co., Fukuoka, 720 pp.

Okajima S, Masumoto M (2014) Species-richness in the Oriental fungus-feeding thrips of the genus *Azaleothrips* (Thysanoptera, Phlaeothripidae). Zootaxa 3846(3): 301–347. https://doi.org/10.11646/zootaxa.3846.3.1

ThripsWiki (2023) ThripsWiki—providing information on the World's thrips. http://thrips.info/wiki/Main_Page [Accessed 31 Aug 2023]